7. The converter of claim 1[,] further including a bi-directional switch connected between said first input terminal and said second input terminal, said bi-directional switch being [response] responsive to a control voltage synchronized with said AC voltage source.--

REMARKS

This is in response to the Office Action mailed July 12, 2001. Accordingly, a petition to extend the time for response three months accompanies this Amendment, together with the required fee.

Section 112 Rejections

Claims 1 - 7 stand rejected under 35 USC §112, second paragraph. Applicant has amended claim 1 to remove reference to "said inductive element." Claims 4 - 7 have also been amended to improve their readability and consistency.

Section 103 Rejections

Claims 1, 4 and 6 stand rejected under 35 USC §103 as being unpatentable over Tan et al., U.S. Patent No. 5,838,558 ("Tan") in view of Saitou et al., U.S. Patent No. 4,991,075 ("Saitou"). The Examiner states that Tan discloses a low impedance AC source (26) and a bridge rectifier (32) without an inductor connected between the AC source and the first input of the bridge. However, the Examiner asserts that Saitou teaches connecting an inductor between the AC source and a first terminal of a rectifier in order to provide a switching circuit with increased switching frequency. The Examiner alleges that, therefore, it would have been obvious to utilize an inductor between an AC

source and a first input of a bridge for many reasons, including filtering the AC voltage and to further add inductive properties to high speed switching circuits such as taught by Saitou. Applicant respectfully traverses the rejections.

Saitou discloses use of an inductor 5 to reduce switching loss in a switching element 3 controlling current (I_D) through the primary winding 2a of a transformer 2 in a DC- DC converter. Saitou explains that the problem being solved is switching loss in the resistance 21 (See Col. 2, lines 2 - 11) of a "snubber" circuit, which is disclosed to be a prior art means for "securing a safe operating region for the switching element 3 during the switching operation." Col. 1, lines 45 - 48. Saitou explains that the invention "produces no loss in the resistance [21] of [the] . . . snubber circuit because the snubber circuit is not used . . . ." Col. 4, lines 31 - 32. Accordingly, Saitou is seen to teach the use of the inductor 5 as part of a scheme to eliminate the snubber circuit in a DC-DC converter and thereby avoid switching losses arising therein.

On the other hand, Tan discloses a bridge rectifier at the output a transformer in a DC- DC converter. Tan does not propose a "snubber circuit" as defined by Saitou, or any resistance analogous to the resistance 21. Therefore, the clear implication of Saitou is that there is no need to modify Tan to include an inductor analogous to the inductor 5. Accordingly, the references themselves do not teach, motivate or suggest the combination proposed by the Examiner, and the invention is not obvious without additional prior art teachings.

The Examiner attempts to supply the necessary additional prior art teachings in the form of proposed motivations: "to utilize an inductor . . . for many reasons, including [(a)] filtering the AC voltage and [(b)] to further add inductive properties to high speed switching circuits such as that taught by Saitou et al."

Insofar as motivation (b) relies on the teachings of Saitou, it fails for the reason mentioned above, i.e., Saitou only motivates use of the inductor 5 as a part of a scheme for replacing a snubber circuit. The Examiner has failed to identify where Saitou generally teaches use of the inductor 5 "to further add inductive properties to high speed switching circuits."

As for motivation (a), and insofar as motivation (b) is alleged to stand independent of the teachings of Saitou, the Examiner is apparently asserting under MPEP 2144.03 that the proposed general rationales "to filter the AC voltage," and "to further add inductive properties to high speed switching circuits," with an inductor such as the inductor 5 in the structure of Saitou, was "common knowledge in the art or 'well-known'prior art . . . ."

However, the Examiner has provided no evidentiary basis for such assertions and it is respectfully submitted that the assertions do not rise to the level required by MPEP 2144.03, i.e., that they "are capable of instant and unquestionable demonstration as being 'well-known' in the art." Moreover, if there was such a well-known and unquestionable need in the art to add an inductor 5 to the structure of Tan for either of the reasons suggested by the Examiner, one would expect this would have been done. Since Tan did not provide such an inductor, Tan is proof that the Examiner's proposed motivations do not meet the requirements of MPEP 2144.

Claim 5 stands rejected under 35 USC §103 as being unpatentable over Tan and Saitou further in view of the Examiner's assertion that it would have been obvious to change the current through an output inductor by varying the timing of the primary side switches to adjust the current level of an output inductive element to better control the output characteristics. Applicant respectfully traverses the rejection.

Applicant submits that Tan and Saitou do not teach or suggest the claimed invention aside from the additional limitations of claim 5 for the reasons discussed above. Moreover, claim 5 recites the additional feature that the current flowing through the inductor does not reach zero before the voltage produced by the voltage source changes its polarity. The Examiner has not identified any prior art or prior art knowledge that teaches or suggests such a limitation in order to "better control output characteristics." The Examiner's mere assertion that this would be obvious is not a *prima facie* case as required by MPEP 2142.

Claims 2 and 3 stand rejected under 35 USC §103 as being unpatentable over Tan and Saitou and further in view of Cowett, Jr., U.S. Patent No. 5,359,277 ("Cowett"). The Examiner states that Tan and Saitou disclose the claimed invention except for replacing the rectifier elements with controlled synchronous rectifiers, yet Cowett shows a rectifier composed of controlled switches 26A - 26D. Applicant respectfully traverses the rejections.

Applicant submits that Tan and Saitou do not teach or suggest the claimed invention aside from the additional limitations of claims 2 and 3, for the reasons discussed above. Moreover, claims 2 and 3 recite the additional features that some or all of the rectifiers are controlled synchronous rectifiers.

In the context of an AC output active power factor correction circuit, Cowett discloses: "[i]n order to allow for four quadrant operation, i.e., to allow for current to be applied to the AC input lines as well as to be extracted from said lines, bridge circuit 26 includes driven switches 26A, 26B, 26C and 26D, rather than diodes . . . ." Col. 4, lines 4 - 8. Setting aside the fact that the driven switches disclosed in Cowett are not synchronous rectifiers, there is no teaching or suggestion in

Cowett to provide driven switches in the bridge rectifier of an AC-DC converter, if for no other reason than that the motivation "to allow for current to be applied to the AC input lines . . . " is not present in the AC-DC converter.

Claim 7 stands rejected under 35 USC §103 as being unpatentable over Tan and Saitou and further in view of Schutten et al., U.S. Patent No. 4,435,750 ("Schutten"). The Examiner states that Tan and Saitou disclose the claimed invention except for a bi-directional switch, and that Schutten shows that it was known in the art to use a bi-directional switch (16) that switches to position A or B to assist in shaping the output waveform. The Examiner asserts that it therefore would have been obvious to incorporate a bi-directional switch in a rectifier to aid in shaping the output waveform for more precise output control.

Applicant submits that Tan and Saitou do not teach or suggest the claimed invention aside from the additional limitations of claim 7, for the reasons discussed above. Moreover, claim 7 recites the additional features that a bi-directional switch is connected between the first input terminal and the second input terminal and that the switch is responsive to a control voltage synchronized with the AC voltage source.

Schutten discloses positively and negatively rectified AC signals that are not filtered, but rather are chopped by alternately switching therebetween to yield a switched output waveform of given frequency having a positive half cycle following a given segment of the signal at point A and having a negative half cycle following a given segment of the signal at point B. Col. 2, lines 30 - 37. The switched output means 16 switches between the two outputs A and B (see Figure 1).

Aside from the fact that there is no motivation suggested by any of the references to modify

a DC - DC converter to chop positively and negatively rectified AC signals to yield a switched output waveform of given frequency having a positive half cycle following a given segment of the signal at point A (one of the outputs of the bridge) and having a negative half cycle following a given segment of the signal at point B (the other output of the bridge), claim 7 recites that the claimed bi-directional switch is connected between two input terminals, not two output terminals.

For all of the foregoing reasons, it is respectfully submitted that claims 1 - 7 are in condition for allowance, and the Examiner is therefore requested to allow claims 1 - 7 and pass this case to issue.

Respectfully submitted,

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AMEND4.005